C-6.1 Summarize the process by which solutes dissolve in solvents, the dynamic equilibrium that occurs in saturated solutions, and the effects of varying pressure and temperature on solubility.

Revised Taxonomy Level 2.4 <u>Summarize</u> conceptual knowledge

In physical science, students

- Distinguish chemical properties of matter (including reactivity) from physical properties of matter (including boiling point, freezing/melting point, density [with density calculations], solubility, viscosity, and conductivity). (PS-3.1)
  - *In reference to solubility*
    - Understand the term solubility only in terms of whether or not a substance will dissolve.
    - Be able to give examples of solids, liquids, and gasses that readily dissolve in water.
    - Understand the components of solutions (and therefore mixtures) do not chemically combine to form a new substance and therefore, solutions are composed of two substances which each retain their own properties.
      Therefore solubility is a physical property.
- Explain the effects of temperature, particle size, and agitation on the rate at which a solid dissolves in a liquid. (PS-3.5)

Note to teachers: In Physical Science, solubility is defined as a physical property because solutions are defined as homogeneous mixtures. However, as students study chemistry they will find that the dissolving process varies with the characteristics of the solute and the solvent respectively. The attraction of various solute particles to water molecules varies and if this force is strong, the dissolving process is considered a chemical reaction.

- **It is essential for students to**
- Distinguish between solutions, suspensions, and colloids on the basis of
  - Particle size
  - Settling behavior
  - Capacity to be separated by filtration
  - Capacity to scatter light (Tyndall Effect)
- Describe the formation of a liquid solution
  - Breaking up of the solute into individual components (expanding the solute)
  - Overcoming intermoleculear forces in the solvent to make room for the solute (expanding the solvent)
  - Interaction between the solvent and the solute to form the solution
- Explain solution equilibrium in terms of La Chatliers' Principle

- Distinguish among the following conditions
  - Saturated solution: a solution which contains the maximum amount of solute under the existing conditions (temperature, and volume of solvent)
    - Understand solubility as the amount of substance required to form a saturated solution with a specific amount of solvent at a specified temperature.

- Unsaturated solution: a solution which contains less than the maximum amount of solute under the existing conditions (temperature, and volume of solvent)
- Supersaturated solution: a solution that contains more dissolved solute than a saturated solution contains under the same conditions.
- Understand the effect of pressure on the solubility of gasses in liquids.

- Distinguish among strong electrolytes, weak electrolytes, and nonelectrolytes
- Understand the effect of temperature on solubility of solids in liquids, gasses in liquids, and liquids in liquids

Assessment

The revised taxonomy verb, summarize means "to abstract a general theme or major point" For this indicator, the major focus of assessment should be to insure that students have a conceptual understanding of the terms and concepts associated with the process of solvation. Conceptual knowledge requires that students understand the interrelationships among the basic elements within a larger structure that enable them to function together. In this case, that students understand the interrelationships among the factors that effect the process of salvation.